

small and to become even smaller as the future unfolds. These too argue for setting fees at a modest level to maximize economic welfare.

Our recommendation would be for the Commission to set an initial percentage fee as a function of gross revenue at the low end of the range the Commission has identified in its NPRM (*viz.*, *i.e.*, in the range of 0.5 to 1 percent of gross revenues). We would also recommend that the Commission establish a cap on the maximum level of the fee payments a licensee must make equivalent to the estimate of the spectrum value that informs the Commission's fee setting in the first instance.

Background

In Section II of the NPRM, the Commission notes relevant statutory proscriptions and limitations of the conditions under which licenses may offer ancillary or supplementary services, and cites the relevant statutory language authorizing a fee program when there is compensation for such services other than revenues from the sale of commercial advertising to support free TV. The Commission explains how the subdivision of the 20 Mbps payload bitstream defined by the DTV technical standard will potentially enable the provision of a "flexible array" of services, and invites comment "on various methods of assessing a fee."

Given the way in which the Commission has presented the item for comment, we think it is worth remarking at the outset that, while a variety of practical considerations may be (or, in some cases, not be) relevant to discrimination and selection among various alternatives for assessing a fee, the economics that inform an appropriate selection basically remain the same in all cases. It may well be (indeed, as noted, our view is) that a particular method may be preferred (assuming its reasonable execution), but preferability is itself defined with reference to an economic desideratum. In particular, we think that what the Commission should be after (and what the statute is after) is a reasonably effective means for capturing a portion of the spectrum scarcity rents (to the extent any exist) associated with provision of ancillary and supplementary services. These rents place an upper-bound on the amount the Commission's fees should attempt to recover.²

² As we later note, since fees only apply to ancillary and supplementary services and specifically *not* to non-feeable services, efficiency considerations argue for setting fees at a somewhat lower level.

It may well be difficult and unwise to use specific values bid in auctions of different spectrum resource rights (“directly” or “too directly”) to gauge the value of *differently defined* rights in this case. Nevertheless, in principle, if one could know the results of an auction of such rights without holding it, this would provide a suitable target for *calibrating* an upper-bound on whatever method is deemed, perhaps largely on practical grounds, to be most efficacious for assessing a fee.³ However the fee system is *operationalized*, it should be *calibrated* to collect no more (and optimally probably less) than the relevant spectrum scarcity rents, to the extent that there are any. It may make sense to specify fees as a percentage of gross revenues, but that leaves (or presumes a reasonable answer to) the question of what percentage would be appropriate and that, in turn, demands a standard for judging reasonability.⁴

Since the amount that would have been realized at a real or hypothetical auction of relevant resource rights in principle measures the discounted present value of anticipated spectrum scarcity rents, there is a natural temptation to look to values in other spectrum auctions for purposes of calibrating appropriate fees. This is perhaps a temptation best resisted (for, *inter alia*, the reasons the Commission cites), but resisting it means finding some alternative means of gauging scarcity rents (or defining some other standard of reasonability). Reliance upon the various other methods of assessing a fee the Commission identifies still carries with it the need for some means to calibrate the fees, however structured, to scarcity values (or some other criterion of reasonability).

³ Auction values may not perfectly reflect realized scarcity values, since the future is uncertain and what actually occurs may differ from what has earlier been anticipated.

⁴ Later in the NPRM (at ¶ 28), the Commission remarks that “Clearly, a fee that is based upon gross revenues will be set at a lower percentage rate than a fee based upon net revenues or incremental profits.” One reason it is, in fact, clear that the percentage rate should be set at a lower level in this case would be that the appropriate economic standard in setting the fee is the magnitude of relevant scarcity rents. If costs of producing ancillary and supplementary services are greater than zero, percentage rates set identically regardless of the relevant base (*viz.*, revenues or different measures of economic profits) must produce inconsistent answers. Thus, if the percentage rate has been calibrated accurately to generate expected scarcity rents (or to undershoot them optimally taking into account the distortion of incentives arising from selective imposition of fees) on a net revenue or incremental profit base, the same rate applied to a (larger) revenue base (assuming costs greater than zero) must necessarily overshoot the target.

Goals and General Criteria for Assessing Fees

As the Commission notes, the Telecommunications Act directs that fees “recover for the public a portion of the value of the public spectrum” made available for ancillary or supplementary use by DTV licensees, and that they recover “for the public an amount that, to the extent feasible, equals but does not exceed (over the term of the license) the amount that would have been recovered” in an auction. The Act also requires that fees be designed “to avoid unjust enrichment.”

As the Commission observes (at ¶ 10), “The 1996 Act evidences the intent of Congress that broadcasters be allowed the flexibility to provide such services.” The Commission also expresses its own desire, in implementing a fee program, to avoid dissuading broadcasters from using the DTV capacity to provide feeable ancillary or supplementary services. If the Commission established fees that sought to capture the entire — as opposed to “a portion of the” — scarcity value of the operating rights to supply ancillary and supplementary services, that could be inconsistent with both Congressional intent and the Commission’s own expressed intention. Rents, by definition, refer to factor payments in excess of those necessary to elicit supply of the resource in the first place. Spectrum scarcity rents occur when demands for spectrum resource rights exceed supply at a zero price and, consequently, a positive price serves to ration available supplies.

In principle, as long as the Commission’s fees were only to extract the relevant scarcity rents, they would not adversely affect resource allocation and the supply of ancillary and supplementary services. If the fees were to overshoot, they would discourage supply of such services uneconomically. It needs to be recognized, however, that fees for use of spectrum rights only apply to ancillary and supplementary services. Because fees are not to be applied to non-feeable services, the imposition of fees on ancillary and supplementary services may distort resource allocation inefficiently with attendant losses of economic welfare.

For illustration, suppose a licensee faces a choice between supplying a feeable service worth \$15 or a non-feeable service worth \$10. Suppose the relevant scarcity value were \$7 and that the applicable fee were set at or above this level. The effect would be to incent supply of the non-feeable service even though it is worth less — a clear economic inefficiency.⁵ In this case, to avoid

⁵ Comparing a \$10 value with an \$8 (= \$15-\$7) value, the licensee would choose the former over the latter.

promoting economic inefficiency, the Commission should set the fee at no more/slightly less than \$5, which would incent the licensee to make the economically efficient production decision.

As noted earlier and is widely recognized, an auction of spectrum resource rights provides a means of measuring and extracting anticipated scarcity rents. Thus, Congress' instruction to structure fees, to the extent feasible, to capture what would have been recovered in an auction, and no more, is closely equivalent to an instruction to structure fees to recover scarcity rents. If fees were to capture more than would have been recovered at auction, they would impliedly recover amounts in excess of the anticipated scarcity rents and would, in consequence, likely restrict supplies of ancillary and supplementary services uneconomically.

Similarly, setting fees to capture a reasonable portion of the scarcity rents may also promote competitive parity and equitable treatment. If some competitors are permitted free use of scarce resources that others must pay to utilize, troubling asymmetries may be thereby created. Competition is a discovery process that supplies a means of identifying efficient suppliers and an efficient allocation of resources. Asymmetrical treatment of this sort introduces a kind of distorting "noise" that inhibits the competitive process' ability to identify efficient outcomes by distinguishing the efficient from the less efficient.⁶ "Noise" in the form of arbitrary differences in regulatory treatment inhibits the competitive filtering process' ability to discriminate between differences attributable to genuinely superior performance as opposed to arbitrarily favorable treatment.

Thus, we do not perceive that there is necessarily any significant tension among the various forms of guidance offered by Congress. Establishing a regime that is designed to recover a portion of the relevant scarcity rents supplies a means for reconciling the Act's various requirements in an economically coherent way. This is by no means to suggest that the Commission's task is an easy one, nor is it to deny the existence of any relevant economic tradeoffs.

Prudent policymaking generally entails balancing expected losses stemming from different types of decision errors (*i.e.*, mistakes) in such a way as to minimize the adverse consequences

⁶ This is not quite the same thing as saying, as the Commission does (at ¶ 7), that licensees could be unfairly advantaged if they did not have to pay a fee while competitors have acquired their operating rights at auction. Licensees might be unfairly advantaged if spectrum scarcity rents turn out to be greater than zero in the event and they have not had to pay for usage rights while others have. The amount a competitor may have paid in an earlier auction does not necessarily correspond to the scarcity rents realized in the event. A competitor who has paid more for rights than they turn out to be worth may be disadvantaged, but this may be the result of his overpaying rather than a later competitor's underpaying.

flowing from faulty decisions. In the instant setting, the appropriate level of fees is obviously not known with certainty, in part because the relationships between ultimate objectives and various control variables are themselves complex, uncertain and only hazily fathomed. In establishing a prudent level of fees, the Commission needs to assess the likely losses that would accrue under different circumstances and set fees in such a way as to minimize any anticipated losses deriving from mistakes that occur in setting fees.

In setting fees, the Commission can err by setting them too high or too low. What kinds of harms would result from each type of mistake? If the fees are set too high, there will, generally speaking, likely be adverse consequences primarily in terms of failures to supply services that would be valued by consumers.⁷ Ancillary or supplementary services from which consumers would derive benefits (and the government would receive tax receipts) will either not be introduced or will presumably be supplied to a lesser extent than they would were fees set at a lower level. The adverse consequences that flow from the error of setting fee levels too high thus consist largely in losses of consumer welfare on suppressed production of ancillary and supplementary services. Economic welfare gains that would otherwise be enjoyed fail to materialize because the high fees discourage production and innovation.

If the fees are set too low, there is little break applied on incentives to produce and innovate ancillary or supplementary services, but there may be adverse consequences manifested in terms of a *redistribution* of economic surplus in favor of licensees who pay less than they would if fees were set higher. In contrast to the previous case, the primary effect of setting fees too low is likely not a *loss* of economic welfare, but rather a simple transfer of rents if any exist.

There thus appears to be a rather pronounced economic *asymmetry* in the loss function associated with setting the level of fees. In setting fees, the Commission is, in essence, trading off greater output and enhanced consumer welfare against redistributive impacts (primarily equity concerns and considerations related to competitive parity and the efficiency of competitive discovery procedures advanced earlier). Redistributive effects do not count for nothing; the question is whether they count for as much as foregone consumer welfare from lost production. To the extent

⁷ Of course, if no such services are provided, no fee revenues will be generated for the government.

that they do not count for as much (and to an economist *qua* economist, they generally would not),⁸ that argues for exercising care to avoid fees set at uneconomically high levels.

The Commission might avoid “unjust enrichment” by setting very high fees, but only at a tangible cost in terms of sacrifices in economic welfare from the loss of valued ancillary and supplementary services. If the Commission seeks to minimize more harmful losses stemming from suppression of welfare-enhancing production, it should shade its fees lower. The Commission naturally seeks to avoid both types of errors, but the social costs of erring on the high side are likely greater than the social costs of erring on the low side. This argues for taking especial care to avoid setting excessively high fees. In “striking a balance,” prudence favors lower fees, other salient factors the same, lest high fees discourage valued production.

Proposals for Establishing Fees for Feeable Ancillary or Supplementary Services

The Commission lists four fee options that it deems consistent with the 1996 Act’s guidelines. The first is “a fee akin to the amount that would have been received in an auction of the spectrum.” As we have noted, the bid value at an auction should approximate the discounted present value of the spectrum scarcity rents anticipated at least as of the time of the auction. For this reason, one would hope that whatever fee option is adopted would be “akin” (*i.e.*, bear an approximate relation or connection) to the amount that would have been received in an auction of the *specifically defined* resource rights, if not be “directly” premised on such an amount.⁹

⁸ It is easy to say that more is better; it is harder to say that a dollar less for one person and a dollar more for another person represents a *net* loss/gain in economic welfare considered in aggregate.

⁹ This is not to suggest that fees should be quoted as capital values. For practical reasons, fees need to be scaled to activity levels. Capitalized values set caps on the sum of the fees which should be collected. Recall the Congressional admonition that fees recover “for the public an amount that, to the extent feasible, equals but does not exceed (*over the term of the license*) the amount that would have been recovered” in an auction (*viz.*, the discounted present value of the scarcity rents) (emphasis added). The Commission may wish to afford licensees the opportunity to meet their statutory obligation to pay fees by paying the estimated capital value of the operating rights if they wish to do so. If licensees were to pay such a “fixed” charge, the appropriate corresponding “variable” charge would be set at zero.

It is important to recognize, as the Commission does, that the amount that would have been recovered in an auction depends on the specific content of the resource rights being auctioned.¹⁰ The Congressional Budget Office (CBO) has, for example, actually “guesstimated” the amount that would have been received in an auction of “the [DTV] spectrum.”¹¹ But this guesstimate addresses a somewhat different set of (less constrained) resource rights than is now at issue. Thus, if one were “guesstimating” the amount that would be recovered in an auction of the ancillary and supplementary resource rights now under consideration, one would need to put the scarcity value at a lower level to reflect the conditions on acceptable usage the government has imposed.

Previous auctions have often dealt with substantially different spectrum resource rights than those currently at issue. The fact that a Rembrandt drawing fetched a certain amount at auction may provide scant basis for predicting the auction value of a Cezanne oil — scant basis, but not no basis. Any valuation exercise of this type inevitably entails a process of guesstimation. That, however, does not necessarily imply that this is an inferior approach. After all, *some* approach to estimation of scarcity values (even if implicit) is necessary to proceed with the setting of a fee. Alternatively, some other criterion of reasonability needs to be defined.

We are struck that the kinds of variability and service diversity issues to which the Commission refers (at ¶ 15), by way of questioning the efficiency of an auction-related fee,

¹⁰ The Commission (at ¶ 15) remarks that “it is difficult to identify market transactions that involve the transfer of spectrum usage rights equivalent to that capacity which DTV licensees may use to provide feeable ancillary or supplementary services.”

¹¹ In April 1997, CBO estimated that an up-front auction of the DTV spectrum in 1998 would yield \$12.5 billion if it included a full complement of digital channels (one for each current analog station), or \$9.5 billion if roughly one-quarter of the channels were removed from the auction and given to noncommercial broadcasters at no cost. *See Congressional Budget Office, Where Do We Go From Here? The FCC Auctions and the Future of Radio Spectrum Management?* Note that the CBO’s model calculates auction receipts as a function of the present value of a stream of profits resulting from using the digital channels *primarily* to provide four sub-channels of standard-definition TV programming supported by advertisers (in addition to the program services currently supplied), plus some ancillary and supplementary services. Most of the rents CBO identifies (more than 90 percent) would thus not be available for capture in fees for ancillary and supplementary services since they derive from the supply of advertiser-supported free TV rather than feeable services for which there is separate compensation. CBO and the Office of Management and Budget (OMB) apparently have limited expectations for rents from feeable services. Neither government agency evidently views the likely magnitude of such receipts as sufficiently large as to warrant a separate “line” estimate for budgetary purposes over a five-year planning period.

seemingly apply with similar force to the other fee options the Commission has identified.¹² Some method for scaling fees to activity levels is plainly required, and we would certainly not deny (indeed, we would emphasize) the need for careful analysis and interpretation of the historical record pertaining to spectrum sales and auctions in making any extrapolations of value. Nevertheless, the historical information and trends at least supply some actual data points from which perhaps to begin to draw inferences about plausible valuations.

The Commission (at ¶ 16) states that it is “disinclined to base the fees on a model that would seek to simulate the revenue that would be generated from an auction.” It cites statutory language tying fees to auction value only “to the extent feasible” as affording it “flexibility” in this regard, and invites comment on its interpretation of the Act and on the feasibility of setting fees based “directly” on an auction model.

The meaning or interpretation of the word “directly” strikes as the bone of contention here. No doubt the “to-the-extent-feasible” language is designed to afford some room to maneuver, but we doubt it permits the tie to auction values to be severed completely.¹³ Indeed, as we have been arguing, it is difficult to see how economically appropriate fees can be set without reference to spectrum scarcity values somehow gauged. We agree, however, that such reference perhaps need only be (and perhaps *can* only be) “indirect” and that the mechanics of fee setting may perhaps best be specified or proceed on a different basis.

We think a plausible alternative interpretation of “to the extent feasible,” might well refer to the obvious need for simplification and rough justice/approximation in setting fees with reference to scarcity values. There is likely to be a good deal more “real-world” variability than a simple, administratively workable system of fees can plausibly or practically address. At some point (not very far along, in our view), the benefits of closer approximations and detailed estimates are likely offset by costs of complexity. We would thus interpret “feasible” to mean “economic” and imply

¹² For example, the input/output methodology to which the Commission subsequently alludes (at ¶¶ 17-20) would also presumably have to be particularized to reflect diverse service outputs and operating conditions.

¹³ It is hard to see how the tie can be cut completely given the statutory language previously recited. The Commission’s seeming desire to cut the tie is itself a little discomfiting since the capital value or hypothetical auction value of the scarcity rents places a theoretical limit or “cap” on the fee revenues the government can legitimately and legally collect. Cutting the tie to the hypothetical auction value thus removes a protection against and may, thereby, invite an over-recovery of scarcity values by the government which could, in turn, thwart provision of feeable services.

Congressional recognition of the need to weigh costs and benefits of administrative complexity in setting up a fee regime.

Relationship Between the Value of the DTV Spectrum and Revenues

Before proceeding with its evaluation of alternative fee options, the Commission spends several paragraphs (17-20) describing the neoclassical economic theory of production by way of providing a "conceptual basis" for estimating the scarcity value of the resource rights used for production of ancillary and supplementary services. The Commission solicits comment on this conceptual framework.

It is unclear from the Commission's discussion whether it actually contemplates the empirical identification of input/output relationships between spectrum resources and outputs of various ancillary and supplementary services. This would constitute a formidable analytical undertaking involving a substantial resource expenditure¹⁴ and would, as the Commission itself remarks (at ¶ 20), "only approximate the implicit value of DTV spectrum *over a range of possible quantities* of the DTV capacity actually used to produce specific ancillary or supplementary services" (emphasis added). Interestingly, this is because "market-determined prices of DTV spectrum are unavailable" and, without knowing the unit price (*viz.*, scarcity value), it is hard to discern the instant margin. If spectrum were free (*i.e.*, had no scarcity value, perhaps because artificial scarcities had been obliterated by enlightened government spectrum policies), profit maximization entails expansion of spectrum utilization to the point where its value of marginal product is zero.

If this approach were poorly implemented, there is a danger that rewards properly attributable to other scarce factors of production, including entrepreneurial effort and intellectual creativity, may be improperly attributed as spectrum scarcity rents. The fact that licensees successfully exploit opportunities to supply feeable services does not automatically translate into spectrum scarcity rents.

¹⁴ One difficulty for this approach is that the specific identity of many (most?) ancillary and supplementary outputs is currently unknown as are the specific production technologies that will be utilized to transform inputs into outputs. In our view, considerations of practicality likely make a "rough-and-ready" approach to fee-setting the only economically sensible course, notwithstanding the likely existence of considerable scarcity-relevant variability and diversity.

Attributing portions of any residual values amongst particular factors of production does not strike as a straightforward exercise either conceptually or operationally when account is taken of a "flexible array" of potential outputs and production functions.

It is thus unclear what the purpose of this section is, particularly if, as seems to be the case, the discussion is not meant to describe or outline an actual fee or scarcity value estimation strategy the Commission contemplates undertaking (at least in the near term) or is in a position to undertake given the information requirements. Instead the purpose seems mainly to motivate the idea that a fee could be assessed as a function of revenues or profits and still be conceptually related to spectrum scarcity values. On the one hand, this seems unexceptionable; on the other hand, actual implementation of the approach, which is seemingly not immediately contemplated or actually practicable given the information and work requirements, at best promises only "an approximation of an implicit value over a range" and, even then, only after some heavy empirical lifting. So we seem to be back to or not to have progressed much beyond the issue of a standard of reasonability for setting a fee.

Fee Based Upon Net Revenues/Incremental Profits/Gross Revenues

The Commission then turns to explicit consideration of three regimes in which fees are assessed on the basis of licensees' net revenues, incremental profits and gross revenues respectively. A seeming advantage of the first two approaches is that they tie fee payments to the actual realization of economic surplus/rent. Not all (or indeed any) rents may be attributable to spectrum scarcity, but if there are no rents, that precludes there being any spectrum scarcity rents. This "authentication" benefit comes at a cost in that implementation of either approach entails detailed measurement and apportionment of costs. A putative advantage of the incremental profit (compared to the net revenue) approach is that it avoids problems of apportioning joint and common costs, although whether this counts as an advantage seemingly turns on whether the applicable percentage fee rate has been suitably adjusted downward to reflect the understatement of costs and overstatement of profits that results from ignoring recovery of joint and common costs. The appropriate fee needs to be discounted to reflect the existence and non-inclusion of joint and common costs and the resultant overstatement of profits and rents.

A fee based upon gross revenues avoids the problem of cost measurement altogether and thus has much to be said for it from the standpoint of economizing on administrative burdens. It too requires a compensating adjustment in the level of applicable percentage fee rates to reflect the existence and non-inclusion of relevant costs and the resultant overstatement of profits and rents. This approach avoids the problems and administrative burdens associated with cost measurement. At the same time, unless care is taken to adjust the applicable percentage fee rate to reflect the non-measurement of costs, it runs the risk of mis-gauging the actual extent of scarcity rents, establishing excessive fees and imposing economic welfare costs in terms of an under-supply of ancillary and supplementary services.

In addition to ensuring that the applicable percentage fee rate is suitably discounted, we think it would perhaps also make sense, if the gross revenue approach were adopted, for the Commission to adopt a safeguard affording licensees the right to file relevant cost data demonstrating the absence of profits and rents and consequent absence of liability for spectrum fees, should they wish to do so.¹⁵ If the Commission has made appropriate compensation for non-inclusion of costs in gauging fee liabilities, incentives to seek such waivers will likely be minimal. By the same token, should waivers be frequently sought, that would signal the Commission that it has likely erred and failed to set an adequately discounted percentage fee rate.

Relatedly, we note that the Commission has floated the idea of a hybrid fee, embodying both fixed and variable elements. A flat fee would, as the Commission remarks, constitute an up-front cost which might deter licensees from offering particular ancillary and supplementary services. Moreover, a flat fee would seemingly further remove fee-paying from the actual realization of scarcity rents. In the case of incremental profits and gross revenues there is, in principle, a compensating adjustment in the level of the percentage fee rate to reflect any overstatement of rents resulting from non-consideration of relevant costs. In the case of a flat fee, a fee is paid regardless of whether any *revenue* is earned, let alone whether any profits or scarcity rents are realized.

The Commission suggests that there might be advantages in the hybrid approach to the extent that higher fixed fees would permit lower marginal fee rates and less "drag" at the margin on incremental exploitation of operating rights to supply ancillary and supplementary services (on the

¹⁵ This safeguard would provide additional assurance that fees create no disincentive to develop and market experimental and similar high-risk services.

theory that "lump-sum" taxes could be less distorting of efficiency).¹⁶ One might imagine a family of two-part fee "tariffs" from which licensees might select their preferred mix of fixed and variable fee. As long as licensees were afforded freedom to select from a family of properly calibrated options, there could conceivably be some utility in this approach. Against these potential benefits must, of course, be weighed the cost of the complexities its formulation and administration would likely entail.

If it starts with some notion of what the scarcity value of the operating rights is, the Commission ought presumably to be indifferent with respect to the manner in which applicable fees are collected. For example, if a licensee were willing to pay the discounted scarcity value up-front, that ought to absolve the licensee from paying any variable charge. In this case, the fixed part of the two-part tariff is simply the scarcity value (appropriately discounted for time and reduction of risk) and the percentage fee rate is zero.¹⁷ Alternatively, the licensee may wish to make no fixed payments, in which case the percentage fee would be calibrated to recover gradually the sum of the anticipated scarcity rents as they are realized over the life of the licenses. As before, a key issue appears to be what the standard for recovery should be, that is, what the scarcity value of the operating rights is.

Percentage Rate of Fee

This brings us to what we regard as the principal challenge posed by the task of synthesizing a system of fees for ancillary or supplementary use of the DTV spectrum. As we have remarked at several points in our review of the Commission's NPRM, the objective of the exercise and the standard by which success ought to be gauged is the extent to which a system of fees enables the government to appropriate an economically sensible portion of any scarcity rents associated with use of the relevant spectrum to supply ancillary and supplementary services.

While relevant scarcity rents may tend to be proportional to revenues or profits from sales of such services, they are not necessarily so and are certainly not synonymous with these measures.

¹⁶ A hybrid fee structure might thus supply a means to cope with the efficiency distortion caused by the selective imposition of fees.

¹⁷ One can also envision an annualized analog of this type of tariffing arrangement.

Consider that a firm may be able to transform sand into highly valued computing capabilities by combining it with other factors of production, notably human intellect, but that this does not convey a high scarcity value on sand. That sand can be supplied at low cost and that there are substitutes for sand make the scarcity value of sand minimal, notwithstanding the valuable uses to which sand may be put. DTV licensees may eventually be able to utilize their operating rights to supply valued feeable services and may even earn economic profits in so doing. These possibilities do not automatically translate into spectrum scarcity rents anymore than that billions of dollars' worth of computer sales imply that sand possesses a high scarcity value or that sand supply ought to be more highly remunerated.

The scarcity value of these particular spectrum operating rights is uncertain. How can it be otherwise when business plans for exploitation of the rights are only now in the course of being formulated? These plans themselves only represent partially informed guesses and intuitions about potentially profitable business ventures. They have not yet been subjected to, let alone deemed economically worthwhile by, "the market test." Given this cloudy state of affairs, it is also difficult to evaluate the extent to which there may be economical *substitute* sources of the specific types of productivity potentially afforded through use of these particular operating rights, whether in the form of other spectrum operating rights or other kinds of technologies.

In this kind of situation, it often makes sense not to try to cross bridges until you come to them. The problem is that there may not be any bridges to cross if mistakes are made early on which deter investments and creation of new markets. As noted earlier (pages 5-7, *supra*), that supplies a principled argument for taking care not to kill golden-egg producing ventures before they are hatched by setting fees at excessive levels. There is, at the same time, considerable evidence suggesting that scarcity rents are not likely to amount to much.

Scarcity values reflect the interaction of economic forces of supply and demand. Generally speaking, as the FCC has rationalized its management of the spectrum and substantially increased the supply of spectrum resource rights, the scarcity value of the spectrum has progressively fallen. This is illustrated by the secular decline in the auction values of various spectrum resource rights used for mobile communications services, which fell from over \$3 per MHz per pop in 1994 to some

30 cents per MHz per pop in 1997.¹⁸ Indeed, if one were extrapolating based on the trend in auction values, one would predict that scarcity values will soon become virtually nil.

The FCC's recent auction of licenses for local multipoint distribution services imply very small scarcity values (*viz.*, less than *one-fifth of a cent* per MHz per pop). These licenses generally appear to embody resource rights for services similar to, although arguably more expansive and valuable than, the rights to offer ancillary and supplementary services using the DTV spectrum.¹⁹ Even the LMDS values may thus overstate the value of DTV rights to supply ancillary and supplementary services.

There are two other important factors to consider in evaluating the potential scarcity value of DTV ancillary and supplementary service operating rights. These are the likely supplies of substitute productive capabilities available through exploitation of other spectrum operating rights and use of different technologies. In addition to a variety of other operating rights the Commission has authorized that would potentially compete with DTV ancillary and supplementary rights, the repacked spectrum obviously constitutes a quite substantial potential source of additional supply capacity exerting further downward pressure on scarcity values. In addition, there are a large number of investment projects involving plans to deploy mega-capacity broadband fiber networks.²⁰ The seeming plethora of potential substitute supply alternatives raises an important issue: The fact that operating rights afford the opportunity to deploy a technical supply capability does not necessarily imply that there is a viable business associated with exploitation of the capability.²¹

Suppose the scarcity value of the DTV ancillary and supplementary rights were put at about \$40 million, *i.e.*, *equivalent* (on a per-pop per-MHz basis) to what the LMDS rights recently fetched at auction. This is still a generous estimate given the "ancillary and supplementary" nature of the services whose provision is authorized through partial/constrained use of the DTV bitstream.

¹⁸ See Summary Table I, "Selected FCC Auctions" in CBO, *Where Do We Go From Here?*, *op. cit.*, p. xii.

¹⁹ The DTV spectrum will be used to supply non-feeable services (*viz.*, free TV) so only part of the relevant digital bitstream will be available to supply ancillary and supplementary services.

²⁰ George Gilder, "Piping Hot," *Forbes ASAP*, February 23, 1998 (available on the Internet at <www.forbes.com/asap/98/0223/110.htm>).

²¹ The fact that my car is capable of transporting additional persons between my home and workplace does not necessarily mean I can earn rents supplying a commutation service.

Assuming a 10-percent discount rate and 15-year term for purposes of simple estimation, a \$40 million capital valuation amounts to a little more than \$5 million on an annual basis. If the annual sales volume of ancillary and supplementary services amounted to about \$500 million per year, an amount that does not appear implausible on its face, a 1-percent percentage fee rate would thus generate the annualized capital value.

Conclusion

There are strong analytical arguments and compelling empirical evidence that fees for ancillary and supplementary services should be set at modest levels to maximize economic welfare. A small percentage fee assessed on gross revenues can be reasonably expected over time to produce amounts approximately equivalent in aggregate to what an auction of ancillary and supplementary operating rights would likely produce.